Synopsis of Thesis Entitled

A Scientific and Community Scorecard-Based Study of the Effects of Urbanization on Surface and Subsurface Freshwater Ecosystems of the Godavari River in Nanded, Maharashtra, India.

To be submitted to

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ABSTRACT

This project aims to investigate the impact of urbanization on the freshwater ecosystem of Nanded, Maharashtra, India, specifically focusing on the Godavari River, which is the lifeline of the region. The increase in impervious surfaces due to urbanization can disrupt the natural processes that support these ecosystems, leading to a decrease in the availability of freshwater resources for plants, animals, and humans. Moreover, urbanization can cause an increase in pollutants and nutrients that enter water bodies, which can negatively affect the health and diversity of freshwater species. The study area will cover various sections of the river, including the upstream, midstream, and downstream areas. The study aims to identify the sources of pollution, quantify the extent of damage caused by human activities, and provide recommendations for policy and management strategies to mitigate the adverse effects of urbanization on the environment and freshwater resources. The study is significant in the context of the recent incident of a large number of dead fish found on the banks of River Godavari in Nanded, highlighting the urgent need for a study on the impact of an urban footprint on freshwater ecosystems.

Keywords: Freshwater, Urban Footprint, Pollution

INTRODUCTION

The expansion of urban areas has significant impacts on freshwater ecosystems, including rivers and ground water. The increase in impervious surfaces such as roads, buildings, and pavement can change the water cycle and disrupt the natural processes that support these ecosystems. Urbanization can also increase the amount of pollutants and nutrients that enter water bodies, which can negatively affect the health and diversity of freshwater species.

One of the most significant effects of urbanization on freshwater ecosystems is the alteration of the water cycle. As cities grow, they often replace natural landscapes, such as forests and wetlands, with impervious surfaces. This reduces the amount of water that can infiltrate the soil and recharge groundwater reserves, resulting in a decrease in the availability of freshwater resources for plants, animals, and humans (McDonnell et al., 2019). In addition, urbanization can cause an increase in stormwater runoff, which can lead to flash flooding, erosion, and sedimentation in rivers and streams (Wolman and Schueler, 2000).

Another impact of urbanization on freshwater ecosystems is the introduction of pollutants and nutrients. Cities generate a wide range of pollutants, including oil, heavy metals, pesticides, and fertilizers, which can contaminate surface and ground water. These pollutants can accumulate in the tissues of aquatic organisms, affecting their growth and survival, and can also impact human health if they enter the drinking water supply (Dodds and Whiles, 2010). Nutrients such as nitrogen and phosphorus can also be introduced into water bodies through urban runoff and sewage systems, leading to eutrophication and harmful algal blooms (Paerl et al., 2016).

The impact of urbanization on freshwater ecosystems is a growing concern, as the global urban population is expected to reach 68% by 2050 (UN, 2018). It is important to understand the potential effects of urbanization on these ecosystems and to develop strategies to mitigate them. Such strategies may include the use of green infrastructure, such as rain gardens and green roofs, which can help reduce stormwater runoff and improve water quality Additionally, better management of wastewater systems can help minimize the amount of pollutants and nutrients that enter freshwater systems.

NEED FOR THE STUDY

Nanded is a city located in the state of Maharashtra in India. The city has been experiencing rapid urbanization and land use change over the past few decades, leading to significant impacts on the freshwater ecosystems in the region.There are several rivers in the Nanded region, including the Godavari River, which is the lifeline of the region. The river plays a vital role in providing water for irrigation, drinking, and other domestic purposes. However, due to the rapid urbanization in the region, the river has been severely impacted by pollution.

The major sources of pollution in the Godavari River are the discharge of untreated sewage and industrial effluents. The increase in population and the growth of industries in the region have led to a significant increase in the volume of domestic and industrial wastes entering the river. This

has resulted in a decline in water quality, loss of aquatic life, and degradation of the river ecosystem.

In the Past & the recent incident of a large number of dead fish found on the banks of River Godavari in Nanded, Maharashtra (Desk,2023). The incident raises concerns about the impact of an urban footprint on freshwater ecosystems &highlights the urgent need for a study on the impact of an urban footprint on freshwater ecosystems. It is crucial to understand the consequences of urbanization and industrialization on the environment and take appropriate measures to protect freshwater resources and aquatic life from further degradation.

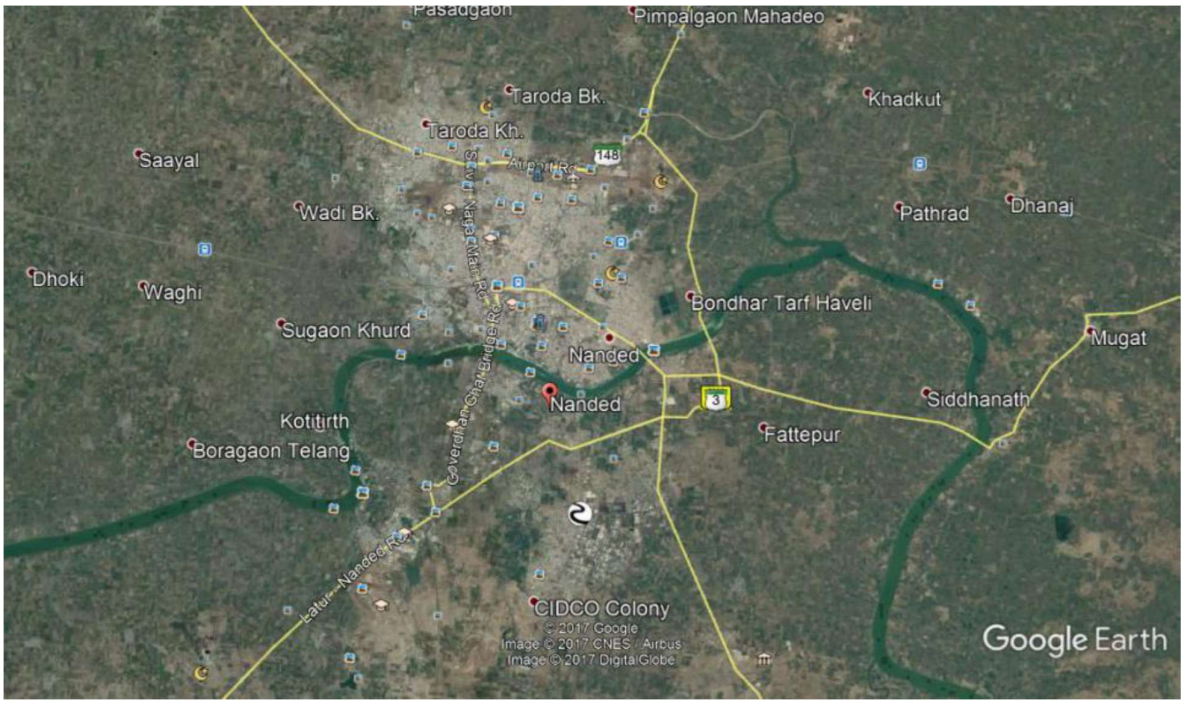
Therefore, there is a need for a comprehensive e study on the impact of urban footprint on the freshwater ecosystem in Nanded. Such a study can help identify the sources of pollution and quantify the extent of damage caused by human activities. It can also provide recommendations for policy and management strategies to mitigate the adverse effects of urbanization on the environment and freshwater resources.

STUDY AREA

Nanded Waghala city is the second largest urban city, after Aurangabad, in the Marathwada region of Maharashtra and is also the administrative headquarters of Nanded district. It is situated in eastern part of the Marathwada region located along the banks of Godavari River. The city is spread across 63.44 sq km and divided into 4 administrative zones, Zone A (Taroda-Sangvi), Zone B (Shivaji nagar-Ashoknagar), Zone C (Vazirabad-Itwara) and Zone D (CIDCO). Nanded city is blessed with the presence of Godavari River, second longest river in India and flows about 5 km in length along the Nanded city. Vishnupuri dam, situated near Asarjan village, has a storage capacity of about 80.79 million cubic meters and is the source of supplying water to the city.

The objective of this study is to investigate the impact of urbanization on the freshwater ecosystem of Nanded by selecting a suitable study area in the Godavari River that flows through the city.

The final selection of sample locations has not been done yet. However, it will be based on a thorough secondary literature review assessment and will consider factors such as the degree of urbanization, proximity to industrial activities, and the presence of agricultural fields. The study will cover various sections of the river, including the upstream, midstream, and downstream areas. For instance, one potential sample location could be near the urban center of Nanded where the river is expected to receive high levels of pollution from both domestic and industrial sources. Similarly, another potential sample location could be located downstream of the city where agricultural activities may contribute significantly to pollution levels.



OBJECTIVES

1. To evaluate the pollution status of a freshwater ecosystem by identification and Analysis of both physical and chemical parameters in both ground and surface water.
2. To do a comparative analysis of Water Quality Index (WQI) in context to drinking water standards.
3. To identify the major contaminants in ground and surface water and their probable sources.
4. To observe to temporal and spatial variation in ground and surface water quality.
5. To suggest remedial measures to avoid ground and surface water contamination.
6. understanding of the linkages between ground water and surface water
7. To increase awareness among farmers, communities, and the public about the importance and benefits of freshwater ecosystems. The study aims to develop a community scorecard that outlines the significance of freshwater resources, identifies threats to these ecosystems, and proposes potential conservation measures.

METHODOLOGY

The proposed study will employ a mixed-methods approach to investigate the impact of urbanization on the freshwater ecosystem of Nanded, Maharashtra, India, with a particular focus on the Godavari River. The study will involve conducting a preliminary survey followed by a detailed survey to achieve its objectives. Groundwater and surface water samples will be collected during both pre and post-monsoon seasons, and their physio-chemical parameters will be analyzed using standard methods. The study will also analyse the temporal and spatial variation in water quality using GIS software. Thematic maps will be generated to identify spatial patterns and trends, and time-series maps will be created to visualize changes over time.

The study will also increase awareness about the importance and benefits of freshwater ecosystems through a participatory approach. Focus group discussions and key informant interviews will be conducted to understand the perceptions and attitudes of local communities towards freshwater ecosystems. The data collected will be analysed to identify key themes and issues, and inform the development of a community scorecard that will be used to educate and raise awareness among the public about freshwater resources. The scorecard will be disseminated through various channels and the impact will be assessed through follow-up surveys and interviews. Local NGOs and government agencies will also be involved in promoting the scorecard and raising awareness about the importance of freshwater ecosystems. The study will ensure the accuracy of the results by verifying them using standard methods, and data quality checks will be performed to ensure accuracy of the results. The fieldwork will be conducted for three years during pre and post-monsoon seasons.

WORK PLAN

Field of study	**A Scientific and Community Scorecard-Based Study of the Effects of Urbanization on Surface and Subsurface Freshwater Ecosystems of the Godavari River in Nanded, Maharashtra, India.**
Start of PhD Work	After RRC
Standard term of study	3 Year
Form of study	Full Time

TIMELINE OF RESEARCH WORK

Tasks	Time Frame (Months)
Review of Literature and procedure preparations	0-6
Collection & Analysis of water samples	6-30
Spatial and temporal analysis using RS-GIS	18-30
FGD & KII to Development of Community scorecard for freshwater ecosystem	18-30
Data collection/statistical interpretation & Thesis Writing	30-36